

# Epitomes

## Important Advances in Clinical Medicine

### Ophthalmology

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*The Council on Scientific Affairs of the California Medical Association presents the following epitomes of progress in ophthalmology. Each item, in the judgment of a panel of knowledgeable physicians, has recently become reasonably firmly established, both as to scientific fact and clinical importance. The items are presented in simple epitome, and an authoritative reference, both to the item itself and to the subject as a whole, is generally given for those who may be unfamiliar with a particular item. The purpose is to assist busy practitioners, students, researchers, and scholars to stay abreast of progress in medicine, whether in their own field of special interest or another.*

*The epitomes included here were selected by the Advisory Panel to the Section on Ophthalmology of the California Medical Association, and the summaries were prepared under the direction of Alfred C. Marrone, MD, and the panel.*

#### Keratorefractive Surgery

"KERATOREFRACTIVE" OR "REFRACTIVE" SURGERY refers to the overall family of procedures that permanently alter the way the eye refracts incoming light. Each procedure achieves its effect by altering the curvature of the cornea. To diminish myopia (nearsightedness), the cornea is flattened. To diminish hyperopia (farsightedness), the cornea is steepened. To diminish astigmatism, the cornea is flattened in the axis of the steeper corneal curvature. The hyperopic procedures, using automated lamellar keratoplasty or the excimer laser, are not as widely done as the myopic and astigmatic procedures. Although there are many forms of keratorefractive surgery, the most common are radial keratotomy, astigmatic keratotomy, automated lamellar keratoplasty, and photorefractive keratectomy using the excimer laser. These procedures are often combined to achieve optimal results.

Patients seek refractive surgery because they wish to see well without physical dependence on glasses or contact lenses, especially in emergency situations, to improve their performance in a profession or sport, or to meet the visual requirements for occupations such as law enforcement or fire fighting. A person with high myopia who cannot tolerate contact lenses may be severely visually handicapped by the need to wear spectacles that diminish the image size and may grossly distort image quality. These patients seek permanent surgical reduction of myopia simply to be able to function in everyday activities.

Radial keratotomy has been done in the United States since 1978 and involves making deep radial incisions into the corneal stroma, leaving a clear central "optical" zone around the pupil into which no incisions are made. Usually four or eight radial incisions are created using a handheld diamond scalpel. Radial keratotomy is effective in diminishing nearsightedness of 6.00 diopters (D) and below, but higher amounts of nearsightedness can be corrected in patients in their 40s or 50s. In radial keratotomy,

about 10% to 25% of patients require a second operation to achieve the final result. The Prospective Evaluation of Radial Keratotomy (PERK) Study, sponsored by the National Eye Institute, found that 92% of patients with low myopia (between 1.50 and 3.00 D) and 86% of patients with myopia between 3.12 and 6.00 D had a visual acuity of 20/40 or better without spectacles or contact lenses five years after the operation. The PERK study serves as a valuable benchmark for evaluating other studies and the results of other keratorefractive surgical procedures.

Astigmatic keratotomy can be done alone or, most commonly, in combination with radial keratotomy, during or after cataract surgery, or following automated lamellar or penetrating keratoplasty to diminish astigmatism. This consists of making transverse or arcuate incisions in the peripheral cornea in the axis of the steeper corneal curvature. These incisions are effective in diminishing astigmatism from 1.00 to 4.00 D.

Automated lamellar keratoplasty is starting to be used to correct high amounts of nearsightedness from about -6.00 to -30.00 D. Although it can also be used to correct low hyperopia from +1.00 to +5.00 D, most clinical experience with this procedure is in correcting myopia rather than hyperopia. In automated lamellar keratoplasty, a motorized microkeratome using a steel blade creates a lamellar dissection of a one-third-thickness hinged corneal flap overlying the pupil. The corneal flap is folded back, and a second pass of the microkeratome permanently removes a central lamellar disc of corneal stroma, the thickness of which is determined by the degree of myopia. The hinged flap is then laid back in place and attaches to the underlying stroma by capillary attraction without the use of sutures. The cornea heals rapidly with minimal discomfort. As with radial keratotomy, the exact postoperative refraction is not entirely predictable for each patient. In a multicenter study involving 100 eyes, 75% of eyes of patients with high myopia achieved vision

of 20/40 or better without the use of spectacles or contact lenses. In this study, 25% of patients required radial keratotomy and 5% required astigmatic keratotomy a few months after the keratoplasty to "fine-tune" the procedure and achieve the final results.

Photorefractive keratectomy is a surgical procedure that recontours the anterior surface of the cornea using 193-nm UV light from the argon fluoride excimer laser. A central circular zone of cornea measuring 4 mm to 6 mm overlying the pupil is ablated. The depth of ablation is determined by the amount of myopia. Although the excimer laser is used widely throughout the world, in the United States clinical trials under the auspices of the Food and Drug Administration (FDA) are currently underway. The excimer laser may soon be approved by the FDA for the treatment of corneal opacities in eyes with corneal scarring or corneal dystrophy, but the FDA must still decide whether or not to approve the procedure for the correction of refractive errors in healthy eyes.

Thus far, studies have shown that the excimer laser is as effective as radial keratotomy in diminishing nearsightedness as high as 6.00 D. Between 88% and 91% of patients demonstrate a visual acuity of 20/40 or better without glasses or contact lenses. As with radial keratotomy, patients with lower amounts of preoperative myopia achieve better results. Repeated operations for undercorrection or scarring will be needed in as much as 14% of treated eyes. Repeated procedures are far more common in eyes with higher preoperative myopia (>6.00 D). Complications such as the reduction of vision due to glare, undercorrection, or overcorrection appear to be no more common than after radial keratotomy. The regression of effect tends to be more common than with radial keratotomy, however, especially when refractions exceed -6.00 D. These problems may be diminished by using larger ablation zones (6 mm). The excimer laser can be combined with automated lamellar keratoplasty to treat high myopia. This protocol is currently being studied by the FDA and is showing favorable results.

Each of the refractive surgical procedures discussed is highly effective for permanently reducing nearsightedness and astigmatism. The final refraction for a patient is not entirely predictable, however. This is why second operations are required for 10% to 25% of patients undergoing each procedure. Although no refractive surgical procedure is without vision-threatening complications, the incidence following radial keratotomy, automated lamellar keratoplasty, and photorefractive keratectomy is low. Persistent symptoms such as glare, halo or starburst effect, occasional foreign body sensation, undercorrection, and overcorrection can be troublesome, but generally are not vision-threatening. A concern with radial keratotomy is the tendency of 15% to 20% of patients to have a continued flattening of the cornea years after the procedure. This can result in hyperopia, so most surgeons leave the eye slightly myopic after the procedure. Radial keratotomy and photorefractive keratectomy seem to be equally effective for correcting myopia below -6.00 D.

Automated lamellar keratoplasty alone or combined with photorefractive keratectomy is effective in diminishing myopia above -6.00 D.

When selecting and counseling a patient for keratorefractive surgery, careful consideration must be given to the patient's expectation for visual result and the person's specific requirements for uncorrected visual acuity. Although patients with unrealistic expectations should be discouraged from having surgical therapy, those who wish to diminish their dependence on spectacles or contact lenses or who require better uncorrected vision for occupational or avocational needs can benefit from refractive surgery.

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## Updated Recommendations From the Optic Neuritis Treatment Trial

ANALYSIS OF DATA from the Optic Neuritis Treatment Trial (ONTT) has resulted in new recommendations for the management of optic neuritis. Whereas initial reports suggested a modest improvement in visual function at six months after a course of intravenous methylprednisolone sodium succinate followed by oral prednisone, one-year follow-up disclosed no notable difference between treated patients and controls. Therapy did, however, result in more rapid improvement of optic nerve function during the first several weeks after the onset of symptoms. Current practice, therefore, is to treat for visual effect only if there is a need to speed early recovery, as in patients with one functioning eye and those who need to recover binocularity quickly for occupational reasons. Oral prednisone therapy alone leads to an increase in the recurrence rate for optic neuritis, and this therapy remains contraindicated for typical cases.

Initial reports suggested no notable value for diagnostic studies such as serologic testing and magnetic resonance imaging (MRI) of the brain in routine cases. This stance has been altered based on newer information. Patients who had abnormal MRI scans, defined by the presence of two or more white-matter lesions of at least 3 mm in diameter, had significantly higher risk (36% versus 3% for those with no lesions) for multiple sclerosis developing within two years. When treated with intravenous methylprednisolone followed by oral prednisone, these patients showed a significantly lower rate of new neurologic events consistent with multiple sclerosis (7.5% versus 16.7% in placebo-treated patients) developing at two